



(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
11.08.2004 Bulletin 2004/33

(51) Int Cl.7: **H01R 12/10**

(21) Application number: **02007278.1**

(22) Date of filing: **02.04.2002**

(54) **A connection system for flexible flat strip cables**

Verbindungssystem für biegsames Flachbandkabel

Système de connexion pour câble plat en bande flexible

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(30) Priority: **03.04.2001 DE 10116454**

(43) Date of publication of application:
09.10.2002 Bulletin 2002/41

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(56) References cited:
EP-A- 0 269 248 **EP-A- 0 431 260**
DE-A- 1 920 988 **GB-A- 2 178 252**
US-A- 3 897 130

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Description

[0001] The present invention relates to a connection system for flexible flat strip cables according to the preamble portion of patent claim 1. Such a connection system is known from EP 0 431 260 A1.

[0002] Flat strip cables are used in vehicles for, for example, loop circuits of multiplex systems for the distribution of current and control signals. Branch conductors lead from these loop circuits to consuming points, sensors or the like. According to the individual equipment of a motor vehicle, different cabling layouts are required. There is therefore a great need for connection systems with which it is possible to connect branch conductors, simply and rapidly, to principal flat strip cable loop circuits.

[0003] EP 0 431 260 A1 discloses a system for connecting a first flexible flat strip cable and a second flexible flat strip cable, each comprising conductors arranged parallel to one another, from which insulation has been stripped in the area of the connection which is to be made and which have available a means for the positive fixing of the flexible flat strip cables to be connected in a connection housing which has an upper housing part and a lower housing part able to be joined together, and an a slide for pressing together the flexible flat strip cables to be connected in the said areas which have been stripped of insulation, characterized in that the slide is a wedge-shaped slide which is able to travel between a front lock-in position and a locking position in the direction of the cable axis, and in that a front face of the wedge-shaped slide is pressed with gradually increasing pressure into the locking position on the flexible flat strip cables by means of a ramp arranged in the upper housing part, whereby the contact areas from which insulation has been stripped frictioning against one another.

[0004] US 3 897 130 shows a flat cable connector including a plug and a receptacle over which flat cables are wrapped. Wrapping said flat cables may raise problems such as interrupting some of the conducting lines or increasing their resistance if they are not broken totally.

[0005] DE 19 20 988 describes a flat cable connector using a wedge and a frame where the cable is, as above, wrapped around the wedge giving raise to the same problems.

[0006] UK 2 178 252 A shows a cammed resilient clamp connection between circuit devices with wedges only on the sides of the connector housing parts such that the male housing may bow over the connecting area providing less contact force between the flat cables to be connected.

[0007] It is accordingly the object of the present invention to provide a connection system for flexible flat strip cables, which can be used to connect several flat strip cables simply and rapidly to one another at any desired points.

[0008] This purpose is reached with the features of Claim 1. Characteristics of preferred embodiments of the present invention appear in subsidiary Claims. The present invention is based on the idea of selectively stripping the insulation from flexible flat strip cables in any places from which branch conductors or the like are to be led, to press the conductor areas stripped of insulation to one another and to provide housings able to be joined together in the simplest possible manner and with which the flexible flat strip cables to be connected can be exactly positioned with respect to one another and subsequently pressed to one another.

[0009] The invention is explained in greater detail by means of the description of preferred embodiment examples and by reference to drawings:

Fig. 1 shows in perspective a longitudinal section of the first embodiment of the present invention;

Fig. 2a to 2e show the preparation of a connection of two flat strip cables, using the connection system according to Fig. 1 and

Fig. 3 shows two versions of the connection of the housing parts.

[0010] Fig. 1 shows a longitudinal section of a first embodiment along the central axis of the flat strip cable 1. This consists of conductors arranged parallel to one another, which are connected to a flexible plastic support and insulated thereby. The connection housing 2 consists of an upper housing part 2a, a lower housing part 2b and a slide 3. As is shown in Fig. 1, the slide 3 can be slid between a front lock-in position and an end lock-in position, in which the areas of the flexible flat strip cable 1a, 1b, which have been stripped of insulation are to be pressed to one another. The upper housing part 2a has a ramp 4, along which the wedge-shaped slide 3, when being slid into its end lock-in position, is pressed increasingly firmly against the flexible flat strip cables lying opposite one another. The locking arm 19 has, in the upper housing part 2a, for locking the wedge slide 3 into the front or back lock-in position, a bracket 20, into which a loosening tool or a fingernail can be inserted in order to take off the lock and release the slide 3. The slide 3 also has a catch stop 13, elastically suspended from the spring arms, which snaps into the corresponding recesses 14 of the branch cable 1b which is to be connected with the principal cable 1a, whereby the branch cable 1b is, during the travel of the slide 3, pulled into its end lock-in position and an exactly defined positioning takes place of the areas of the principal cable 1a and the branch cable 1b which have been stripped of insulation. A pressure rib 18 is formed on the front face of the slide 3, whereby the pressure is locally distributed over a small section surface. This pressure rib 18 may have introduced into it an insert of silicone or rubber or

the like, in order to increase adhesion there between the slide and the branch conductor and in order to achieve an even force distribution over the entire flexible conductor under a permanent load.

[0011] Fig. 2a to 2e show the process of assembly of the first embodiment example of the connection system according to Fig. 1. Fig. 2a shows the upper part 2a of the housing 2 with the pre-assembled slide 3 in the front lock-in position. The upper housing part 2a has, arranged on flexible arms on its sides, outward-pointing snap-in latches 11a and 11b.

[0012] Fig. 2b shows the lower housing part 2b with a floor area 6 for receiving the flexible flat strip cable 1a. This has recesses 8 into which snap the locking stops 7 which are provided in the floor area 6, whereby a precise positioning of the flat strip cable 1a on the floor area 6 of the lower housing part 2b of the housing 2 takes place. Fig. 2b moreover shows the areas 21 which have been stripped of insulation, opposite which should lie the correspondingly stripped areas of the branch flat strip cable 1b.

[0013] Fig. 2c shows the next step of the assembly, in which both the housing parts 2a and 2b are joined to the pre-assembled slide 3, where the two housing parts snap to the end of the guide grooves 9a or 9b by means of the snap-in latches 11a, 11b.

[0014] Fig. 2d shows as the next step the insertion of the branch flat strip cable 1b into the assembled housing from the side on which the actuating surface 22 of the wedge-shaped slide 3 protrudes from the housing in the front lock-in position. The branch flat strip cable 1b is inserted into the housing 2, until the recesses 14 which are provided on the flat strip cable 1b, reach the level of the snap-in catch stops 13 which snap into the said recesses and lock the branch flat strip cable 1b opposite the slide 3.

[0015] Lastly, Fig. 2e shows the wedge-shaped slide 3 in the end lock-in position in which the connection between the two flat strip cables 1a, 1b is made. During the travel of the slide 3 into the end lock-in position, the slide pulls the branch conductor by means of locking of the catch stop 13 into the recess 14, where, by means of the wedge 4, the pressure with which the flat strip cables 1a, 1b are pressed to one another gradually rises. Through the friction between any areas of the two flat strip cables 1a, 1b, from which insulation has been stripped, the said contact areas are simultaneously cleaned, thereby improving electrical contact.

[0016] Fig. 3 shows two construction-related possibilities of fastening the two housing parts 2a, 2b to one another. On the left is shown interconnection by means of insertion vertically to the cable axis. The housing parts 2a, 2b are locked together by means of locking elements 12a, 12b. The version illustrated on the right side of Fig. 3 corresponds, on the other hand, to the embodiment example shown in Fig. 1, where the housing parts 2a, 2b are inserted into one another in the direction of the cable axis and then locked, as has already been ex-

plained earlier in greater detail.

[0017] The preceding description of an embodiment of the present invention has the object of illustration only and is not to be regarded as being in any way limiting.

Claims

1. A connection system for connecting a first flexible flat strip cable (1a) and a second flexible flat strip cable (1b), each comprising conductors arranged parallel to one another, from which insulation has been stripped in the area (15) of the connection which is to be made and which have available means for the positive fixing of the flexible flat strip cables to be connected in a connection housing (2) which has an upper housing part (2a) and a lower housing part (2b) able to be joined together, and a slide (3) for pressing together the flexible flat strip cables (1a, 1b) to be connected in the said areas which have been stripped of insulation, **characterized in that** the slide (3) is a wedge-shaped slide which is able to travel between a front lock-in position and a locking position in the direction of the cable axis, and **in that** a front face (16) of the wedge-shaped slide (3) is pressed with gradually increasing pressure into the locking position on the flexible flat strip cables (1a, 1b) by means of a ramp (4) arranged in the upper housing part, whereby the contact areas (15) from which insulation has been stripped frictioning against one another.
2. A connection system according to Claim 1, **characterized by** the fact that the slide (3) is a flexible slide, on whose front face is arranged a ramp (4) in a housing part (2a), on which the flexible tongue (5), which is able to be pressed on the flat strip cables (1a, 1b) which are to be connected is arranged, the slide being able to travel in the direction of the cable axis between a front lock-in position and a locking position.
3. A connection system according to one of the preceding Claims, **characterized by** the fact that a lower housing part (2b) has a floor area (6) to receive a principal flexible strip cable, with at least one locking stop (7) to snap into at least one corresponding recess (8) in the cable (1a).
4. A connection system according to Claim 3, **characterized by** the fact that the lower housing part (2b) has axially placed side walls (9a, 9b), with sliding grooves for the introduction and locking of an upper housing part (2a), arranged axially to both sides of the floor area (6).
5. A connection system according to Claim 4, **charac-**

terized by the fact that the upper housing part (2a) has, on flanks (10a, 10b) which snap into the sliding grooves of the lower housing part (2b), outward pointing snap-in latches (11a, 11b) on locking arms running axially.

6. Connection systems according to Claim 3, **characterized by** the fact that the upper housing part (2a) and the lower housing part (2b) can be connected transversely to the direction of the axis by means of being inserted on one another by means of locks (12a, 12b)
7. A connection system according to Claim 2, **characterized by** the fact that the wedge-shaped slide (3) has catch stops (13) arranged on flexible arms for elastic snapping into recesses (14), with which a branch conductor (1b) is, during the travel of the wedge-shaped slide (3), pulled into the locking position, until the contact areas (15) of the flexible flat strip cable (1a, 1b) which is to be connected and from which insulation has been stripped, lie on top of one another.
8. A connection system according to Claim 2, **characterized by** the fact that the elastic tongue (5) is bent into the shape of an S, so that the first convexity (5a) on the front face slides along the ramp (4) of the upper housing part (2a) and the second convexity (5b) is pressed against the flexible flat strip cable (1a, 1b).
9. A connection system according to Claim 1, **characterized by** the fact that the wedge-shaped slide (3) has on its front face (16) a rounded pressure rib (18) which runs transversely to the flexible flat strip cables (1a, 1b).
10. A connection system according to Claim 9, **characterized by** the fact that the pressure rib (18) has, in the area of contact with the flexible flat strip cable, an insert (17) of silicone or the like.
11. A connection system according to Claim 1, **characterized by** the fact that a locking arm (19) on the upper housing part (2a) for locking the slide (3), has a bracket (20) for the insertion of a loosening tool.
12. A connection system according to one of the preceding Claims, **characterized by** the fact that the lower housing part (2b) comprises an insert of silicone or the like, which acts as a support to confer long-term stability in the area of contact to provide contact strength.

Patentansprüche

1. Verbindungssystem zum Verbinden eines ersten Flex-Flachbandkabels (1a) und eines zweiten Flex-Flachbandkabels (1b) mit parallel zueinander beabstandet angeordneten Leiterbahnen, die im Bereich (15) der herzustellenden Verbindung abisoliert sind und mit Mitteln zum Fixieren der zu verbindenden Flex-Flachbandkabel in einem Verbindergehäuse (2), welches einen oberen Gehäuseteil (2a) und einen unteren Gehäuseteil (2b) aufweist, welche miteinander verbunden werden können, und einem Schieber (3) zum Aneinanderpressen der zu verbindenden Flex-Flachbandkabel (1a, 1b) an ihren abisolierten Bereichen, **dadurch gekennzeichnet, dass** der Schieber (3) ein Keilschieber ist, der zwischen einer Vorraststellung und einer Verriegelungsstellung in kabelaxialer Richtung verschiebbar ist, und dadurch, dass die Stirnseite (16) des Keilschiebers (3) durch eine im oberen Gehäuseteil angeordnete Rampe (4) beim Verschieben in die Verriegelungsstellung progressiv mit stärkerem Druck auf die Flex-Flachbandkabel (1a, 1b) gepresst wird, wodurch die abisolierten Kontaktbereiche (15) aufeinander reiben.
2. Verbindungssystem nach Anspruch 1, **dadurch gekennzeichnet, dass** der Schieber (3) ein Federschieber ist, an dessen Stirnseite eine durch eine in einem Gehäuseteil (2a) angeordnete Rampe auf die zu verbindenden Flex-Flachbandkabel (1a, 1b) pressbare Federzunge (5) angeordnet ist, wobei der Federschieber in Richtung der Kabelachse zwischen einer Vorraststellung und einer Verriegelungsstellung verschiebbar ist.
3. Verbindungssystem nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** ein unteres Gehäuseteil (2b) eine Bodenfläche (6) zur Aufnahme eines Haupt-Flex-Flachbandkabels aufweist mit mindestens einem Verrastnocken (7) zum Eingriff in mindestens eine entsprechende Ausstanzung (8) im Kabel (1a).
4. Verbindungssystem nach Anspruch 3, **dadurch gekennzeichnet, dass** das untere Gehäuseteil (2b) axial zu beiden Seiten der Bodenflächen (6) Seitenwände (9a, 9b) mit axialen Gleitnuten zur Einführung und Verrastung eines oberen Gehäuseteils (2a) aufweist.
5. Verbindungssystem nach Anspruch 4, **dadurch gekennzeichnet, dass** das obere Gehäuseteil (2a) an den in die Gleitnuten des unteren Gehäuseteils (2b) eingreifende Flanken (10a, 10b) nach außen weisende Rastnasen (11a, 11b) an axial verlaufenden Rastarmen aufweist.

6. Verbindungssystem nach Anspruch 3, **dadurch gekennzeichnet**, dass das obere Gehäuseteil (2a) und das untere Gehäuseteil (2b) durch Aufeinanderstecken mit Rasten (12a, 12b) quer zur axialen Richtung miteinander verbindbar sind. 5
7. Verbindungssystem nach Anspruch 2, **dadurch gekennzeichnet**, dass der Keilschieber (3) Rastnocken (13) zum elastischen Eingreifen in Ausstanzungen (14) in einer zu verbindenden Abzwegleitung (1b) aufweist, mit denen die Abzwegleitung (1b) beim Verschieben des Keilschiebers (3) in die Verriegelungsstellung mitgenommen wird, bis die jeweiligen abisolierten Kontaktflächen (15) der zu verbindenden Flex-Flachbandkabel (1a, 1b) übereinander liegen. 10 15
8. Verbindungssystem nach Anspruch 2, **dadurch gekennzeichnet**, dass die Federzunge (5) S-förmig geschwungen ist, sodass die stirnseitige erste Ausbauchung (5a) auf der Rampe (4) des oberen Gehäuseteils (2a) entlang gleitet und die zweite Ausbauchung (5b) gegen die Flex-Flachbandkabel (1a, 1b) gepresst wird. 20 25
9. Verbindungssystem nach Anspruch 1, **dadurch gekennzeichnet**, dass der Keilschieber (3) an seiner Stirnseite (16) eine quer zu den Flex-Flachbandkabeln (1a, 1b) verlaufende abgerundete Anpresslippe (18) aufweist. 30
10. Verbindungssystem nach Anspruch 9, **dadurch gekennzeichnet**, dass die Anpresslippe (8) im Kontaktbereich mit dem Flex-Flachbandkabel eine Einlage (17) aus Silicon oder dergleichen aufweist. 35
11. Verbindungssystem nach Anspruch 1, **dadurch gekennzeichnet**, dass ein Rastarm (19) auf dem oberen Gehäuseteil (2a) zum Verrasten des Schiebers (3) eine Lasche (20) für den Eingriff eines Lösewerkzeugs aufweist. 40
12. Verbindungssystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet**, dass das untere Gehäuseteil (2b) eine Einlage aus Silicon beinhaltet, die als Abstützung im Kontaktbereich eine Langzeitstabilität zur Gewährleistung der Kontaktkraft bildet. 45

Revendications

1. Système de connexion pour la connexion d'un premier câble plat en bande flexible (1a) et un second câble plat en bande flexible (1b), chacun comprenant des conducteurs disposés parallèlement l'un par rapport à l'autre, dont l'isolation a été dénudée dans la zone (15) de la connexion qui doit être réa-

lisée et qui possède des moyens disponibles pour la fixation positive des câbles plats en bande flexible à connecter dans un boîtier de connexion (2), qui a une partie boîtier supérieure (2a) et une partie boîtier inférieure (2b), capables de se rejoindre, et une glissière (3) pour presser ensemble les câbles plats en bande flexible (1a, 1b) à connecter dans lesdites zones dont l'isolation a été dénudée, **caractérisé en ce que** la glissière (3) est une glissière en forme de coin qui est capable de se déplacer d'une position de verrouillage frontale à une position de blocage dans la direction de l'axe du câble, et **en ce qu'une** face frontale (16) de la glissière en forme de coin (3) est pressée, avec une pression graduellement croissante, dans la position de blocage sur les câbles plats en bande flexible (1a, 1b) au moyen d'une rampe (4) disposée dans la partie boîtier supérieure, moyennant quoi les zones de contact (15) dont l'isolation a été dénudée frictionnent l'une contre l'autre.

2. Système de connexion selon la revendication 1, **caractérisé en ce que** la glissière (3) est une glissière flexible, sur la face frontale de laquelle est disposée une rampe (4) dans une partie boîtier (2a), sur laquelle est disposée la languette flexible (5), qui est susceptible d'être comprimée sur les câbles plats en bande flexible (1a, 1b) qui doivent être connectés, la glissière étant capable de se déplacer dans la direction de l'axe du câble d'une position de verrouillage frontale à une position de blocage.
3. Système de connexion selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'une** partie boîtier inférieure (2b) a une zone de plancher (6) pour recevoir un câble en bande flexible principal, avec au moins une butée de blocage (7) s'enclenchant dans au moins un évidement correspondant (8) dans le câble (1a).
4. Système de connexion selon la revendication 3, **caractérisé en ce que** la partie boîtier inférieure (2b) a des parois latérales placées dans l'axe (9a, 9b) avec des rainures de glissement pour l'introduction et le blocage d'une partie boîtier supérieure (2a), disposée dans l'axe des deux côtés de la zone du plancher (6).
5. Système de connexion selon la revendication 4, **caractérisé en ce que** la partie boîtier supérieure (2a) a, sur ses flancs (10a, 10b), qui s'enclenchent dans les rainures de glissement de la partie boîtier inférieure (2b), des verrous d'enclenchement pointant vers l'extérieur (11a, 11b) sur les bras de blocage se déplaçant axialement.
6. Systèmes de connexion selon la revendication 3, **caractérisés en ce que** la partie boîtier supérieure

(2a) et la partie boîtier inférieure (2b) peuvent être connectées transversalement dans la direction de l'axe en étant insérées l'une sur l'autre au moyen de verrous (12a, 12b).

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7. Système de connexion selon la revendication 2, **caractérisé en ce que** la glissière en forme de coin (3) possède des butées de retenue (13) disposées sur les bras flexibles pour l'enclenchement élastique dans les évidements (14), avec lesquels un conducteur ramifié (1b) est, au cours du déplacement de la glissière en forme de coin (3), poussé en position de blocage, jusqu'à ce que les zones de contact (15) du câble plat en bande flexible (1a, 1b), qui doit être connecté et dont l'isolation a été dénu- 10
dée, se situent l'une sur l'autre. 15
- 20

8. Système de connexion selon la revendication 2, **caractérisé en ce que** la languette élastique (5) est courbée en forme de S, de manière à ce que la première convexité (5a) sur la face frontale glisse le long de la rampe (4) de la partie boîtier supérieure (2a) et la seconde convexité (5b) soit comprimée contre le câble plat en bande flexible (1a, 1b). 25
- 30

9. Système de connexion selon la revendication 1, **caractérisé en ce que** la glissière en forme de coin (3) a sur sa face frontale (16) une rainure de pression arrondie (18) qui se déplace transversalement en direction des câbles plats en bande flexible (1a, 1b). 30
- 35

10. Système de connexion selon la revendication 9, **caractérisé en ce que** la rainure de pression (18) possède, dans la zone de contact avec le câble plat en bande flexible, un insert (17) en silicone ou similaire. 35
- 40

11. Système de connexion selon la revendication 1, **caractérisé en ce qu'un** bras de blocage (19) sur la partie boîtier supérieure (2a), pour bloquer la glissière (3), possède une console (20) pour l'insertion d'un outil détachable. 40
- 45

12. Système de connexion selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la partie boîtier inférieure (2b) comprend un insert en silicone ou similaire, qui agit comme support pour conférer une stabilité à long terme dans la zone de contact pour donner une résistance de contact. 50
55

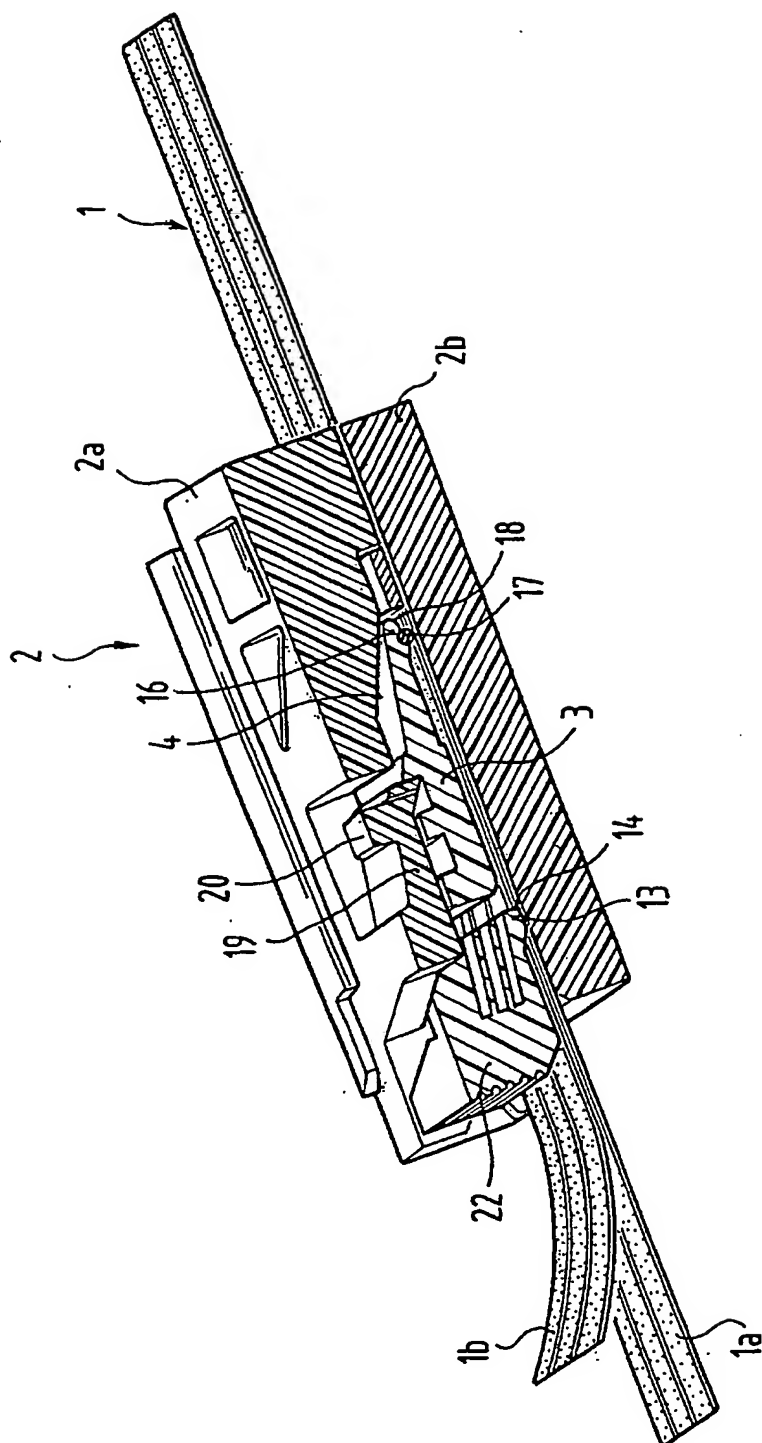


FIG. 1

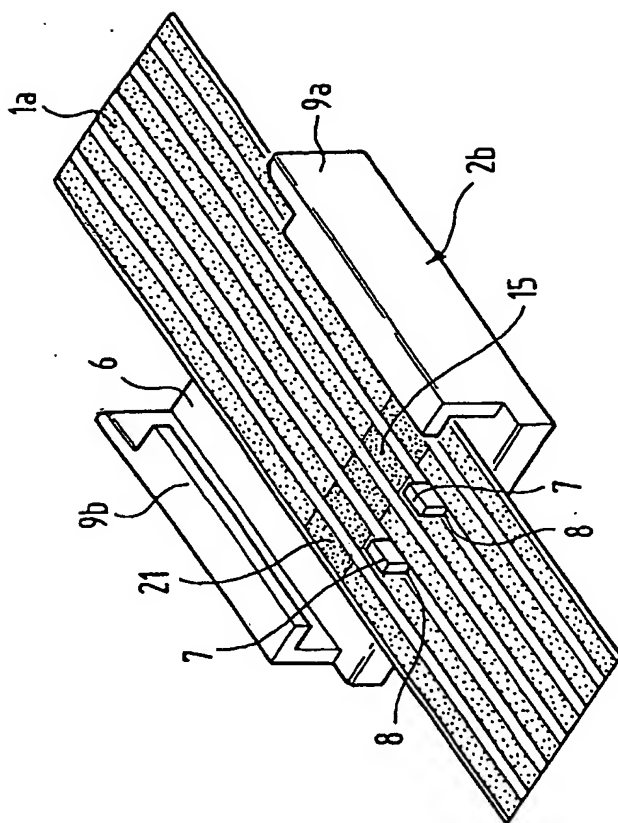


FIG. 2b

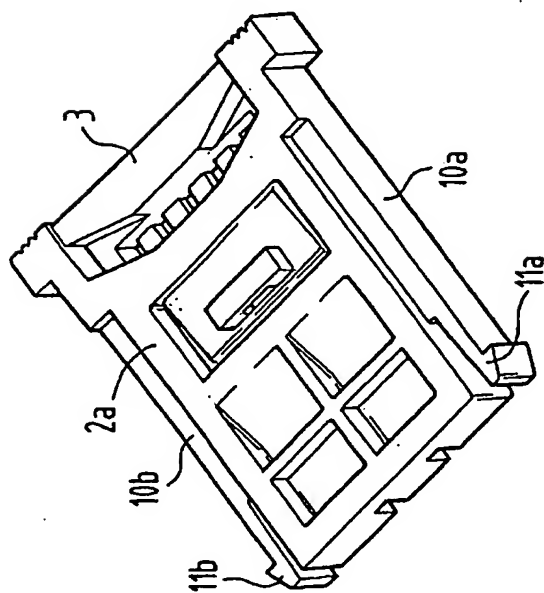


FIG. 2a

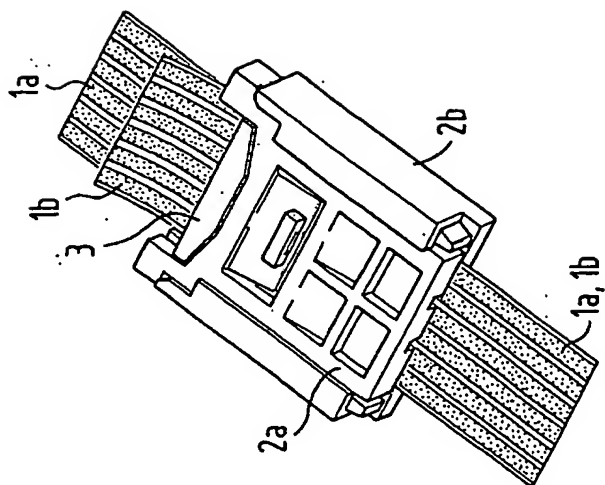


FIG. 2e

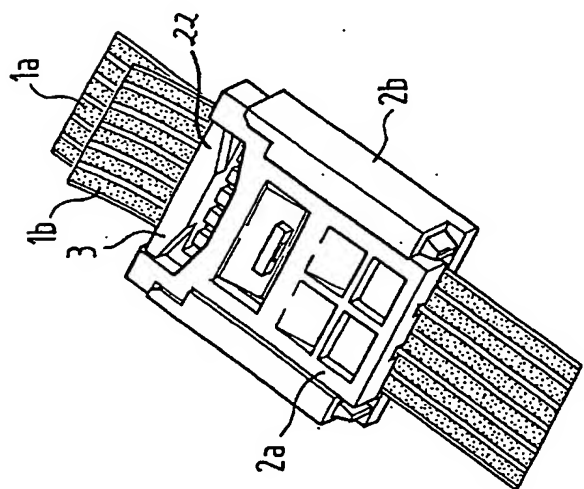


FIG. 2d

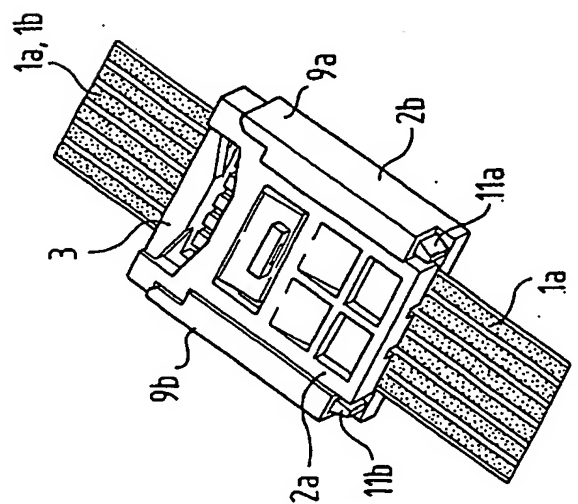


FIG. 2c

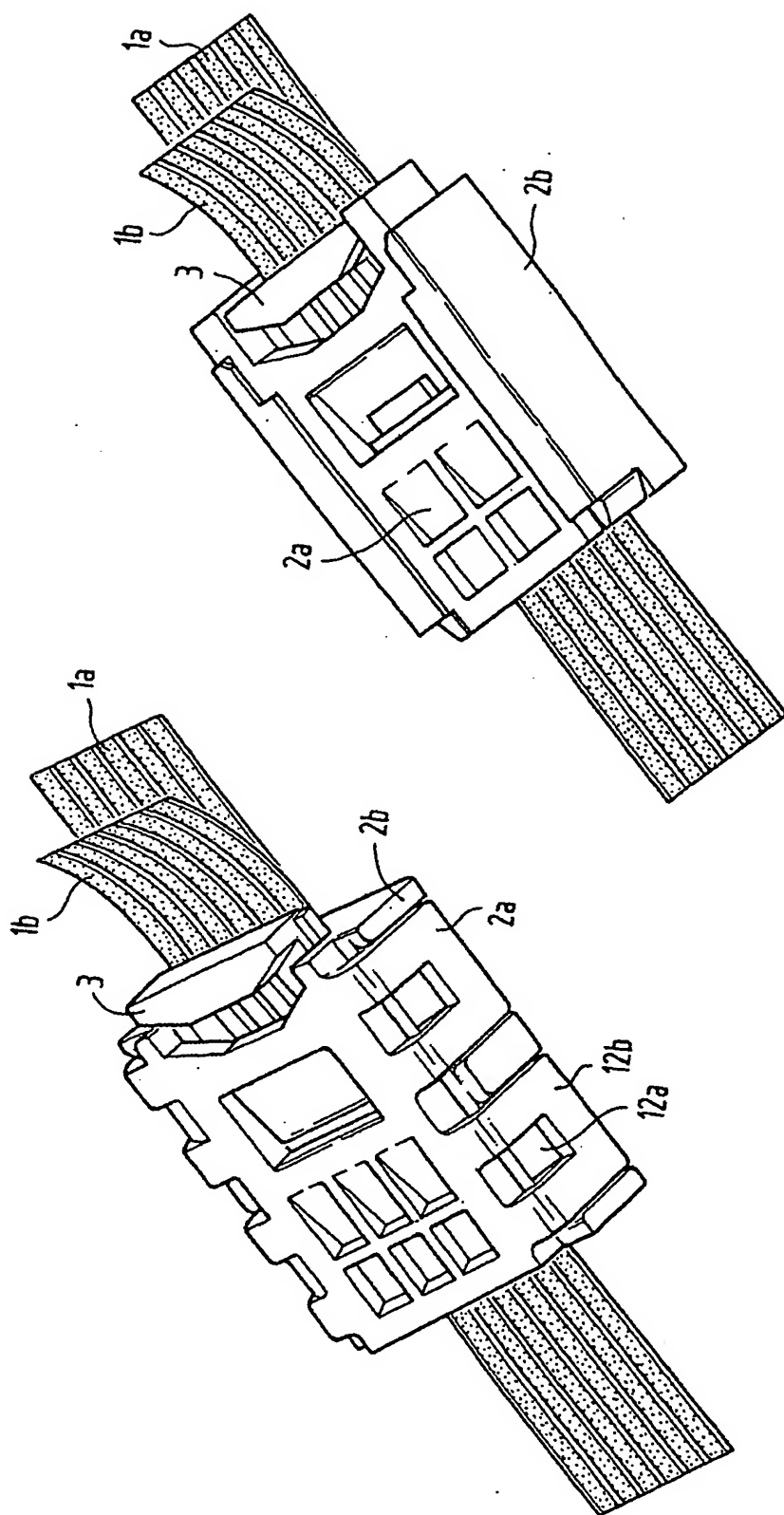


FIG.3